

Arabian Cement Company Avoids Costly Unplanned Downtime By Solving Complex Vibration Problem

RESULTS

- Saved about \$28,000 USD by avoiding a production shutdown
- Prevented bearing failure, avoiding further damage to plant equipment
- Reduced maintenance costs through predictive maintenance



APPLICATION

Motor-driven hammer crusher, located at the end of the grate cooler on No. 1 kiln, is capable of crushing 1200 tons per day of cement clinker.

CUSTOMER

The Arabian Cement Company plant in Rabigh, Saudi Arabia, operates five kilns with a total capacity of about 2.5 million tons of clinker per year and 3 million tons of cement has been in operation since 1984. The company, with headquarters in Jeddah, is a leading supplier of cement for the construction boom in the Middle East. A new production line is being constructed at the Rabigh plant, and there are plans to build a new plant in Jordan.

CHALLENGE

To keep the production lines running without interruption as a way to limit costs, the company needed to establish a strong predictive maintenance program.

A complex problem threatened to halt production on the No. 1 kiln. A 75 kw AC induction motor running at 1199 rpm drives (via a v-belt) a hammer crusher located at the end stage of grate cooler number 1. This equipment is critical to production, since any sudden stoppage will force the kiln to shut down. When high noise and vibration were observed coming from the powerful motor and/or its hydraulic coupling, plant employees were concerned that a failure was imminent.

“AMS Machinery Manager is an important tool in providing information about the condition of rotating equipment throughout this plant, enabling us to effectively reduce costs through predictive maintenance.”

Ahmed M. Ibrahim
Predictive Maintenance Engineer
Arabian Cement Co.

SOLUTION

Plant personnel had been monitoring the hammer crusher for some time and thought the problem had been solved. Four months earlier, a mechanical team reported that there was no “looseness” of any kind in the hydraulic coupling, and just one month earlier, the electrical team had changed the motor end covers and replaced the motor bearings. Despite this fix, motor vibration increased dramatically soon after the line was started up after a two-week shutdown.

Using Emerson’s machinery analyzer with slow speed technology kit and AMS Machinery Manager, Predictive Maintenance Engineer Ahmed Ibrahim discovered a severe vibration (11.14 mm/s overall) at the harmonics of the motor’s rotational speed from 1X to 20X, indicating that despite previous repair efforts the vibration problem was indeed getting worse.

In the shop, no looseness could be found within the motor; the bearings looked good, and the lubricant was clean. There was also no indication of wear or looseness in the coupling’s bearing housing or in the shaft. The fit between the shaft and the bearing was okay, and everything looked normal. However, closer examination of ball bearing NTN 6024 revealed a radial clearance that Ibrahim could feel with his fingers. Careful measurement indicated a clearance of 1.90 mm. A severe ball indentation was also noticed on the outer race.

“The hammer crusher by its nature is subjected to severe impacts and variable loads,” Ibrahim said. “The ball bearing was not shielded, and after the worn out motor bearings and end covers were replaced, this bearing started to bear the brunt of the crusher shocks, especially during startup and shutdown.”

Replacing the damaged bearing cost only a few hundred US dollars, whereas the cost of a failure, including power loss and production loss over the 24-hour repair period, would have been almost \$29,000 USD, saving the plant many thousands of dollars. The life of the kiln was also prolonged by replacing this small component before vibration could cause catastrophic damage to associated equipment.

“Emerson’s tools for determining machinery health tools are very good and effective in our plant.”

Ahmed M. Ibrahim
Predictive Maintenance Engineer
Arabian Cement Co.



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